error; but it is impossible to do everything at the same time and in a single step. It was necessary to establish the fundamental idea firmly, and in doing this the minor details were temporarily neglected. When it has been firmly established that the circulation of the hot gases in a furnace is a problem in hydraulics, when the fog which has obscured these problems and appeared to make them insoluble has been cleared away, then it will become possible to settle the various details in a suitable manner.

The complete working out of the laws governing the theory of the circulation of the hot gases, which has been commenced by Professor Yesmann, should be continued by experts in hydraulics. It is our province, as men of deeds, to check the working methods of existing furnaces and to deduce therefrom the practical rules which it is necessary for us to know in determining their design.

I am at present engaged in this work, as are many of my students who are constructing furnaces in numerous workshops in Russia. When sufficient progress has been made, it will be possible to give the methods for the design computations of all types of furnaces.

The very simplicity of the conclusions to which I was led were rather disconcerting. But their approval by my colleagues at the Polytechnic Institute—M. Kir pitch ow, Professor of Applied Mechanics, and M. Mechtchersky, Professor of Theoretical Mechanics—encouraged me to publish the original of the present volume.

It was only natural that I should desire to submit my work to a high authority, such as M. Le Chatelier; the translation of the work into French afforded such an opportunity, and I am greatly pleased by the honor which he has conferred upon me in introducing me, in such flattering terms, to my new readers.

W.-E. GROTJME-GKJIMAILO.

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